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16. ABSTRACT

This report explains which Science Advisory Board recommendations and findings were incorporated into the standards of the technical support documents and which were not. The document also provides the Agency's rationale for those decisions.

Since it was anticipated that many of the SAB's recommendations would be incorporated into the standards, the Agency requested public comments on the SAB report on May 8, 1984 with an announcement of availability in the Federal Register (49 FR 19604). A total of 39 individuals and organizations submitted comments; this document also responds to those comments.

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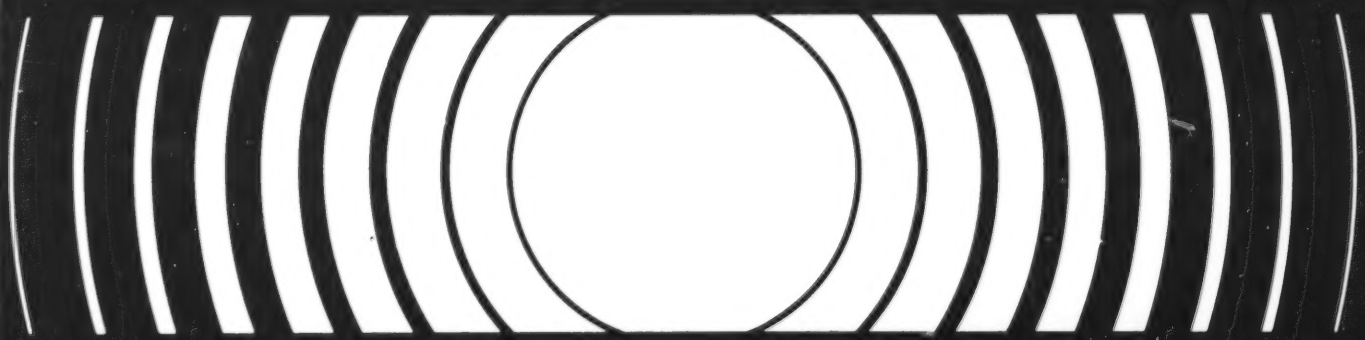
Response to Comments for Final Rule

Volume II



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40 CFR Part 191
Environmental Standards for the
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Transuranic Radioactive Wastes

EPA 520/1-85-024-2

RESPONSE TO COMMENTS

FINAL RULE FOR HIGH-LEVEL AND TRANSURANIC RADIOACTIVE WASTES

Volume II--Science Advisory Board Comments

August 1985

U.S Environmental Protection Agency
Office of Radiation Programs
Washington, D.C. 20460

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Chapter 1: INTRODUCTION

The Science Advisory Board (SAB) is the largest and most important of EPA's advisory panels. It was first established by the Administrator in 1974 and was re-established in 1978 by legislative mandate under the Environmental Research, Development, and Demonstration and Authorization Act. The SAB is the Agency's principal institutional link with the independent scientific community. Its mission is to help ensure the scientific accuracy, authority, and reliability of Agency products. SAB meetings are open to the public and are announced in advance. Its findings, which are advisory in nature, are made public, including its recommendations for Agency action. The SAB also reports annually to Congress.

The first SAB review of an Office of Radiation Programs (ORP) project was undertaken for this rulemaking. The Executive Committee established a special subcommittee for this purpose, called the High-Level Radioactive Waste Disposal Subcommittee. The Agency announced the first meeting of the Subcommittee in the January 5, 1983 Federal Register (48 FR 509) for the purpose of "organizing a review of the scientific and technical bases of the proposed standards for the management of spent fuel, and high-level and transuranic radioactive wastes, 40 CFR Part 191." The Subcommittee held nine meetings during 1983, the final meeting being on September 21, 1983. Since the main effect of these standards will be in the siting and design of repositories, the main effort of the Subcommittee went to reviewing the models used as the basis of the EPA analyses supporting the disposal standards of the proposed 40 CFR Part 191. There was extensive technical interaction between the staff of ORP and the members of the Subcommittee. On February 17, 1984, the Subcommittee's final report was approved by the Executive Committee and forwarded to the Administrator.

The primary purpose of this document is to explain which recommendations and findings were incorporated into the standards or the technical support documents and which were not. The document also provides the Agency's rationale for those decisions.

Since it was anticipated that many of the SAB's recommendations would be incorporated into the standards, the Agency requested public comments on the SAB report on May 8, 1984 with an announcement of availability in the Federal Register (49 FR 19604). A total of 39 individuals and organizations submitted comments; this document also responds to those comments.

In organizing this response document, it was necessary to rearrange the presentation in the SAB Subcommittee report. More than 60 findings and recommendations were identified in the "Executive Summary" and "Major Findings and Recommendations" sections of the Subcommittee's report. For ease of response and to avoid repetition, these were condensed into 46 items by combining recommendations and findings that were identical or very similar. These items are reproduced in this document, with page references to their appearance in the SAB report ("ES" refers to the Executive Summary and "MFR" refers to the "Major Findings and Recommendations"). In several instances, supporting text from the SAB report has also been reproduced to clarify the SAB comment.

These 46 items were then arranged in the order of the first appearance in the report, except that a few recommendations were moved to facilitate combined responses. Next, the public comments on the SAB report were placed with the appropriate recommendations. Finally, responses were written which considered both the SAB recommendations and the corresponding public comments. It should be noted that appended to the SAB report were the reports of the various task groups which were formed by the Subcommittee. The recommendations of each task group are not addressed by the Agency because only the recommendations and findings in the main body of the report constitute the official advice and guidance of the SAB to the Agency.

After evaluating the SAB report and the public comments received, the Agency agreed with 34 of the 40 findings and recommendations that primarily addressed technical issues, and partially agreed with two other technical recommendations. Of the 36 technical recommendations that the Agency agreed with in part or in full, five did not require any action by the Agency. Thus, 31 of the primarily technical recommendations have resulted in changes either in the final rule, in the analyses supporting the final rule or in other Agency actions. The four technical recommendations with which the Agency disagreed are identified as SAB Findings 17, 29, 30, and 38 in this document.

Six other SAB recommendations addressed "risk management" or other policy issues (SAB Findings 1, 2, 4, 9, 16, and 22). These were considered as suggestions comparable to those received during the public comment periods on the proposed rule and were evaluated in the context of the public comments received on the SAB report. The Agency agreed with two of these six (neither of which required action on the EPA's part) and partially agreed with two others. The Agency disagreed with Findings 2 and 22 of these six policy-related recommendations.

The transcripts of all the High-Level Radioactive Waste Disposal Subcommittee meetings and all the public comments referred to in this document are filed in Public Docket Number R-82-3 which is located in EPA's Central Docket Section, West Tower Lobby, 401 M Street, SW, Washington D.C. 20460. A reasonable fee may be charged for copying.

Chapter 2: EPA's RESPONSES TO THE SCIENCE ADVISORY BOARD SUBCOMMITTEE FINDINGS AND TO PUBLIC COMMENTS ON THE FINDINGS

Finding 1: "The Subcommittee supports the general form of the proposed standards, including (a) the use of a societal objective as an upper bound of acceptable health (cancer and genetic) effects, (b) the focus on performance standards in terms of release limits rather than individual exposures, (c) the reference level of the initial 10,000 year time frame applicable to both the societal objective and the release limits, (d) the use of a probabilistic approach, and (e) the use of qualitative assurance requirements, as modified by the Subcommittee, but issued as Federal Radiation Protection Guidance to other Federal agencies in lieu of inclusion in the proposed rule." (ES p.2)

Response: Both technical and policy issues are addressed by this summary finding. The final rule retains the general form of the standards as supported by the SAB Subcommittee. However, as discussed in the EPA Response to SAB Finding 22, the qualitative assurance requirements have been retained in the final rule (rather than issued as Federal Radiation Protection Guidance) for disposal facilities not licensed by the Nuclear Regulatory Commission (NRC). The assurance requirements have been withdrawn for NRC-licensed disposal facilities in deference to equivalent requirements that NRC is developing for inclusion in 10 CFR Part 60.

Finding 2: "The Subcommittee recommends that the release limits specified in Table 2 of the proposed standards be increased by a factor of ten, thereby causing a related ten fold relaxation of the proposed societal objective (population risk of cancer)." (ES p.2, MFR p.10)

"Two members of the Subcommittee, Dr. Lash and Dr. Giletti, dissent from this view. They believe that the Office of Radiation Programs' more stringent standard is justified and can be met by sufficient numbers of proposed disposal sites." [ES p.2]

"The Subcommittee notes that the proposed release limits are directly related to the societal objective of not exceeding 1,000 deaths in 10,000 years, and thus, compliance with this recommendation carries with it a related ten fold increase in the societal objective. The relaxation of the release limits is, in the Subcommittee's opinion, justified for the following reasons. First, the proposed release limits in Table 2,

and therefore the proposed societal objective, are considerably more stringent than those standards generally required or adopted in today's society (see for instance Table A on page 12 of (the SAB) report). Second, in addition to the fact that some of the cancer deaths which might result from these releases are calculated using conservative assumptions that probably overestimate the number, some of these deaths would have resulted at least in part from the unmined ore from which the wastes were subsequently generated, and thus are substitutional rather than additional in nature. Third, the Subcommittee believes that the compounding of conservatism by EPA in the choice of probabilities and specific model parameters used throughout the analysis is not warranted." (ES p.3)

Public Comment: All 39 of the commenters addressed this finding, far more than commented on any other single issue in the SAB report. Those commenters (M-5, M-17, M-18, M-21, M-25, M-36, M-39) who agreed with the recommendation said that the risk level is well below internationally-accepted risk levels and that the models are overly conservative.

Among the commenters who disagreed, the NRC (M-37) saw no need to increase the level from an implementation point of view. The States (M-2, M-4, M-12, M-31) saw no compelling justification for relaxation, especially when the SAB recognized that the levels appear achievable at some sites; and the States argued that levels of uncertainty are so high that they justify conservatism. The States also predicted a loss of credibility with the public if relaxation occurs. The environmental/public interest groups (M-3, M-9, M-10, M-11, M-15, M-24, M-34) cited reasons, similar to the States', for disagreeing, but added arguments that the other levels of risk which SAB said exist are not necessarily acceptable and that SAB overstepped its bounds by recommending policy. The private citizens' comments (M-6, M-7, M-8, M-13, M-14, M-16, M-19, M-20, M-22, M-23, M-26, M-27, M-28, M-29, M-30, M-32, M-33, M-38, M-40) generally followed one or more of the themes expressed by the States and environmental/public interest groups with emphasis on 1) existing standards and risk levels not necessarily being acceptable, 2) the uncertainties involved justifying conservatism, and 3) the loss of credibility with the public.

One other commenter (M-35) said that the phrasing of the SAB recommendation was inherently contradictory because, had the number of deaths been significantly overestimated, then increasing the release limits would not result in an increase in the number of estimated deaths. This commenter suggested that the SAB reword its recommendation to make clear that the number of deaths will not be increased due to the proposed increase in the release limit.

Response: This recommendation primarily involves issues associated with policy and risk management, rather than the technical aspects of the rule. After performing revised analyses of the capabilities of mined geologic repositories to isolate the wastes covered by these disposal standards, the Agency continues to believe that many of the options being considered within the national program can reasonably achieve release limits that correspond to the level of protection associated with the

proposed rule. Therefore, the Agency agrees with the large majority of public commenters that this risk objective should not be relaxed.

With regard to the three reasons offered by the SAB Subcommittee in support of this recommendation:

1) The Agency does not believe that the Panel demonstrated that the standards are "considerably more stringent than those generally adopted or required in today's society." Furthermore, such comparative risk considerations by themselves normally would not be a primary determinant of appropriate residual risk levels when making risk management decisions (considerations of control technologies and cost effectiveness usually receive greater emphasis).

2) The view that some of the residual risks from high-level radioactive waste or spent fuel disposal are substitutional for those that would have been caused by the unmined ore is a perspective that the Agency agrees is useful in considering the level of protection that should be afforded future generations. In fact, this perspective is one of the reasons that the Agency did not choose more stringent containment requirements for the final rule (although more stringent levels of protection appear reasonably achievable at some of the sites now being considered by DOE). However, the Agency does not believe that this fact justifies choosing the less stringent standards recommended by the SAB.

3) Correcting some of the overestimates of the long-term risks from mined geologic repositories, as recommended by the SAB, has reinforced the Agency's view that the proposed level of protection can probably be met at essentially no additional cost to the national program. As shown in Figure 1, these changes in the Agency's technical analyses make it appear <u>less</u> appropriate to relax the disposal standards, rather than more so.

<u>Finding 3:</u> "EPA should also clarify the analytical framework that forms the basis for the limits in Table 2 of the proposed standards. The Subcommittee believes that such clarification will help to establish clearly the relationship between the release limits and the societal objective, and will facilitate future amendments to the standard as knowledge increases regarding radiation health effects or radionuclide migration in the biosphere." (ES p.3)

<u>Response:</u> The Agency agrees with this recommendation. The relationship of the release limits in Table 1 of the final rule (which was Table 2 in the proposed standards) and the associated population risks is discussed in the preamble to the final rule, and a detailed explantion of the analytical framework is provided in Chapter 7 of the Background Information Document (BID) prepared for the final rule.

<u>Finding 4:</u> "We recommend that the probabilistic release criteria in the draft standard be modified to read 'analysis of repository performance

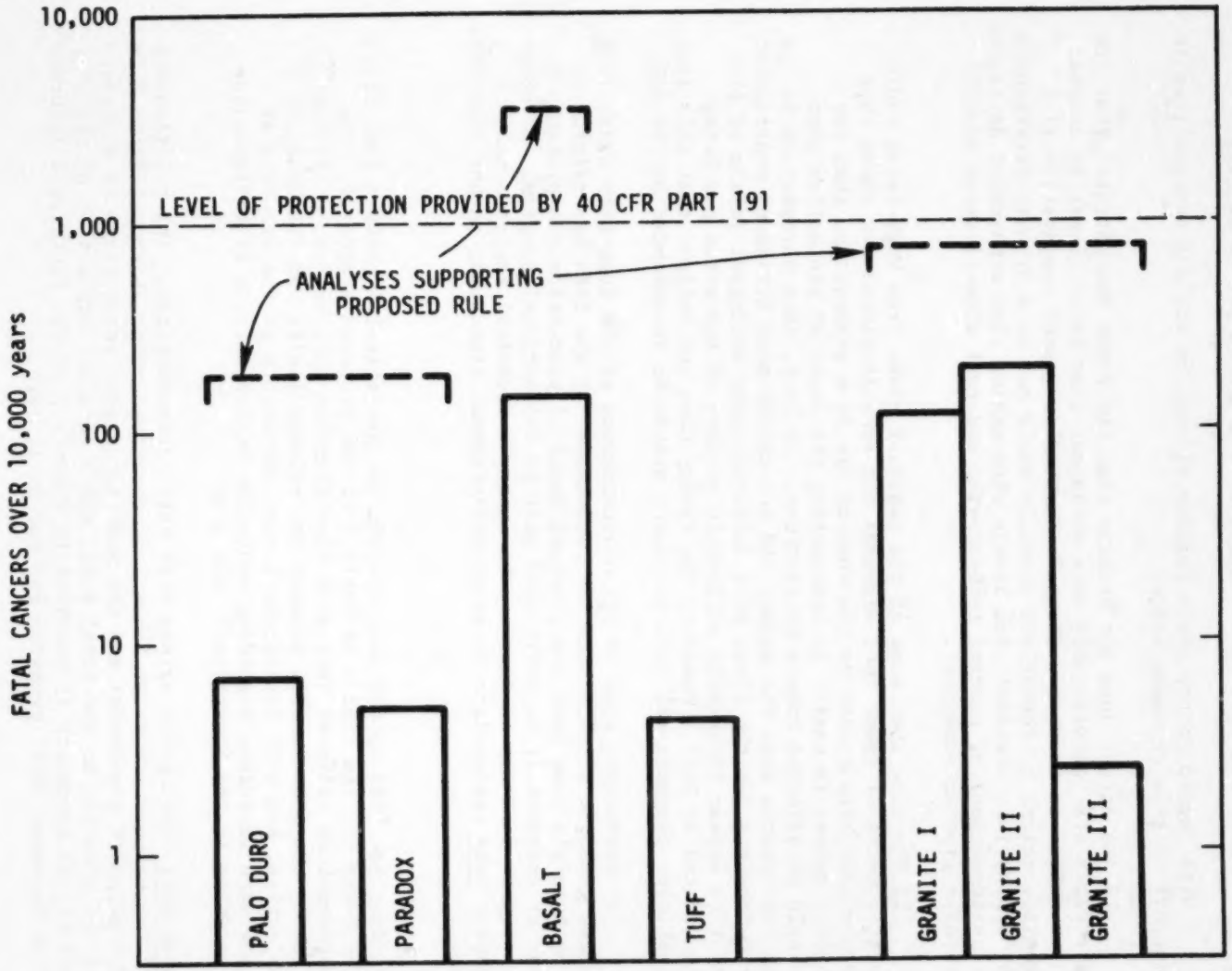

Figure 1. Population risks from disposal in geologic repositores (logarithmic scale, reference case).

shall demonstrate that there is less than a 50% chance of exceeding the Table 2 limits, modified as is appropriate. Events whose median frequency is less than one in one-thousand in 10,000 years need not be considered.'" (ES p.3, MFR p.10)

Public Comment: Three commenters (M-18, M-25, M-36) felt that the analysis of projected repository performance is often subjective and requires expert judgment; thus, it would be very difficult to verify compliance to a set level of confidence.

Four commenters (M-9, M-10, M-15, M-34) argued that a fifty percent chance of exceeding the release limits would be unacceptably low to adequately protect public health and instill public confidence. Also, while the SAB thought that the proposed standard could unnecessarily tie up the licensing process in legal proceedings, these commenters did not think this was a valid consideration for this standard-setting effort.

Response: Upon reexamining the technical basis for the rule, the Agency became aware of greater uncertainties in predicting the frequency of fault movement and also reviewed a report by a United States Geological Survey (USGS) scientist that developed upper bound estimates for these frequencies in various regions of the country (USGS Open File Report 82-972). Based upon this reassessment, the Agency has relaxed the probabilistic release criteria in the final rule (Section 191.13) by a factor of ten from those in the proposed rule to better reflect the state of confidence involved with predicting the occurence of natural disruptive events. Thus, the final rule calls for the cumulative probability of exceeding the final release limits (considering normal and accidental events and processes) to be less than 0.1, and for the cumulative probability of exceeding ten times the release limits to be less than 0.001.

This revision is in the direction of the SAB recommendation; however, it does not go as far as that recommendation. In essence, the Agency agrees with those commenters who suggested that allowing a 50 percent chance of exceeding the containment requirement release limits would not provide adequate confidence of achieving the desired protection of public health. The Agency also agrees with those commenters who state that expert judgment will be an important part of the analyses done to determine compliance with the containment requirements; this issue is discussed as part of the response to the next SAB finding.

Finding 5: "We recommend that use of a quantitative probabilistic condition on the modified Table 2 release limits be made dependent on EPA's ability to provide convincing evidence that such a condition is practical to meet and will not lead to serious impediments, legal or otherwise, to the licensing of high-level-waste geologic repositories. If such evidence cannot be provided, we recommend that EPA adopt qualitative criteria, such as those suggested by the NRC." (ES p.3-4, MFR p.10)

Public Comment: Two commenters (M-5, M-25) agreed with the SAB recommendation. One of these (M-25) does not believe EPA has given an

adequate explanation or basis for selection of the probability levels. One commenter (M-34) disagreed with the recommendation because "legal impediments or other problems" should not be a factor in "public health and safety standards."

Response: As discussed in Chapter 8 of the BID, the Agency has revised and updated its probabilistic performance assessments of mined geologic repositories, evaluating many of the areas that DOE is currently considering as potential locations for the first repository. These assessments indicate that the revised probablistic release limits appear reasonably achievable at all of the sites being considered by DOE (and with essentially no additional cost at most of them). The Agency has also discussed the application of these probabilistic release limits in the licensing process with the NRC, and this has led to inclusion of a new section [191.13(b)] in the containment requirements. This section should ensure that the development of a disposal system that appears to provide the desired protection is not subjected to unwarranted "impediments" because of the inherent uncertainties in analytical projections over very long periods of time. Finally, the final rule includes detailed "Guidance for Implementation of Subpart B" as an informational appendix that describes the Agency's assumptions and expectations about a "practical" implementation process.

Finding 6: "We recommend that EPA retain the 10,000-year time period as the basis for determining the adequacy of repository performance. We believe that use of formal numerical criteria limited to this approximate time period is a scientifically acceptable regulatory approach." (ES p.4, MFR p.14)

Public Comment: The three commenters (M-18, M-25, M-37) who discussed this recommendation agreed with it.

Response: The Agency has retained the 10,000-year period for the radionuclide containment requirements (Section 191.13), which are the primary numerical criteria to determine the adequacy of disposal systems.

Finding 7: "We recommend that the process of selection of sites for disposal systems also take into account potential releases of radioactivity somewhat beyond 10,000 years. Particular attention should be focused on potential releases of long-lived alpha-emitting radionuclides and their decay products." (ES p.4, MFR p.14)

Public Comment: Three (M-3, M-5, M-25) of the four commenters agreed with the proposition. However, one of these (M-5) wants the application limited to the final three sites. The fourth commenter, the NRC (M-37), while agreeing in principle, pointed out that DOE's siting guidelines call for a 100,000-year performance assessment and argued that such a requirement is not within EPA's jurisdiction.

Response: The Agency agrees with the SAB recommendation, for substantial amounts of radioactivity will remain in a disposal system well beyond 10,000 years. Accordingly, EPA worked closely with both DOE and NRC to develop a provision--calling for comparative site evaluations over 100,000 years--that has been incorporated into the DOE "Final Siting Guidelines" (10 CFR Part 960) promulgated on November 30, 1984 (49 FR 47714). These comparative evaluations, which are described in Section 960.3-1-5 of 10 CFR Part 960, will be one of the significant considerations in selecting the sites for the development of repositories from those sites characterized in accordance with the Nuclear Waste Policy Act of 1982 (NWPA). The Agency believes that these comparative evaluations will strongly encourage the selection of disposal sites that provide the best isolation among the alternatives considered and that they will meet the intent of this SAB recommendation.

Finding 8: "We recommend that EPA retain the use of a population risk criterion as the measure of performance for the proposed standards." (ES p.4)

"We find that the 'release limit' approach for expressing the level of protection required of a repository is a satisfactory way of fulfilling EPA's standard-setting mandate, and should be retained by EPA." (MFR p.10)

"We find that an approach employing 'individual dose limits' (considering some 'maximally exposed individual' or alternatively some 'average exposed individual') would in practice make the standard difficult to meet with high assurance for very long times for any repository concept currently under active consideration. However, we recommend that for the first 500 years, the EPA standard embody an extremely low likelihood that increases in radioactivity approaching the limits allowed by the EPA drinking water standards will occur in potable well water drawn from any well adjacent to the site of the repository. For longer time periods, we recommend that EPA rely on the assumption that standards similar to the present drinking water standards will exist to protect groups of individuals." (ES pp.4-5, MFR pp.10-11)

Public Comment: All commenters (M-5, M-10, M-25, M-34, M-36) agreed with the recommendation to retain a population risk criterion; however, two (M-10, M-34) encouraged having an individual standard and two others (M-5, M-36) actively discouraged an individual standard. The NRC (M-37) agreed with the recommendation for an individual dose limit for the first 500 years. However, the main thrust of the NRC comment was to point out that the phrase, "...any well adjacent to the site" clearly shows the SAB intention to be that "groundwater protection requirements be applied only to groundwaters beyond the geologic barrier which serves as part of an overall repository system...."

Response: The Agency has retained limits on the total radionuclide releases from a disposal system over 10,000 years as the final rule's primary numerical performance standards; these limits are designed to

keep risks to populations very small. In addition, the Agency has added provisions in the final rule (Sections 191.15 and 191.16) that limit risks to individuals for 1,000 years after disposal. For longer time periods, the Agency believes that several of the qualitative assurance requirements (Section 191.14) will reduce the likelihood that individuals will receive significant exposures from a disposal system.

Finding 9: "We recommend that EPA initiate action within the Federal Government for the establishment of an interagency council to coordinate the development of high-level radioactive waste disposal policy, standards, and regulatory practices and to serve as a forum for exchange of scientific and technological information." (ES p.5, MFR p.24)

Public Comment: Four commenters agreed (M-3, M-17, M-18, M-25). In addition, three (M-3, M-17, M-18) encouraged State membership, one (M-3) endorsed public membership, and one (M-18) wanted local membership.

Only one commenter (M-10) disagreed because Federal agencies already confer and "appear to reflect different agency mandates rather than a lack of communication", and DOE should not be given a formal role in setting standards which effect high-level waste repository licensing.

Response: Over the past several years, there have been a number of experiments with various types of interagency coordination mechanisms concerning high-level radioactive waste disposal policy, standards, and regulatory practices. Based on this experience, the Agency does not believe that there is a compelling need for a formal "coordination organization" for these purposes. Instead, as one commenter noted, the Federal agencies involved with high-level radioactive waste disposal frequently interact on policy matters. Disagreements between the agencies almost always reflect their differing responsibilities, not a lack of communication or coordination.

On the other hand, the Agency agrees that there could be considerable benefit in an interagency forum to exchange scientific and technological information regarding the high-level radioactive waste program. A Committee on Interagency Radiation Research and Policy Coordination (CIRRPC) was formed in April 1984 under the auspices of the Office of Science and Technology Policy, which provides the Committee chairman. The EPA's Assistant Administrator for Air and Radiation serves as the Vice-Chairman. The Agency will ask the Science Panel of CIRRPC to consider this recommendation.

Finding 10: "We recommend that EPA support, or encourage other agencies to support, continuing research in technical areas where major uncertainties still exist, particularly in the biological effects of radiation, the geochemical transport of radionuclides, and the characterization of rock-mass deformation." (ES p.5, MFR p.25)

Public Comment: Two commenters (M-3, M-25) agreed but one of them (M-25) wants research to be consistent with the NWPA and not be "excessive and open-ended."

Finding 11: "We recommend that EPA encourage research leading to better values for solubilities and retardation factors for the nuclides listed in Table 2 of 40CFR191, plus I-129, Cm-247, Pb-210, Zr-93, and Sb-136." (MFR p.23)

Response (Findings 10 and 11): Although EPA has no authorities or responsibilities to conduct such research, the Agency agrees that it is vital to the success of the national program and will recommend that the Science Panel of CIRRPC encourage and oversee the conduct of a continuing research program.

Finding 12: "We think, however, that EPA has made overly conservative choices and decisions throughout the development of the technical bases supporting the standards, leading to overestimation of the long-term effect of disposal, and hence that the proposed standards are too restrictive and compliance may be difficult to verify." (ES p.6)

"In general, EPA's analytical methodology and modeling used throughout the development of the generic repository's performance, including releases and subsequent cancer deaths, are deemed to be conservative. The Subcommittee makes several suggestions for specific improvements and updating." (ES p.7)

"We find that in their analyses of releases to the accessible environment, EPA has frequently made modeling assumptions and parameter estimates which are conservative. These values were combined in the models, leading to computed releases to the accessible environment that are probably overestimated. While perhaps less conservative, this bias was also carried through in the environmental pathways analyses." (MFR p.19)

Public Comment: Five commenters on this finding (M-5, M-18, M-25, M-35, M-39) agreed that many of the parameter values were conservative and would lead to cancer death estimates higher than would actually be expected to occur. One commenter (M-18) thought adoption of the recommendation would reduce the conservatism. The agreement of one commenter (M-39) centered on the difficulty of compliance verification. Another commenter (M-5) agreed that costs incurred to show compliance with the level of the standard may be high while providing no better protection of the public and the environment.

Response: The Agency agrees that many of the assumptions made in the technical analyses supporting the proposed rule were conservative and tended to overestimate the population risks from mined geologic repositories. Many of these assumptions have been made less conservative in developing the final rule. This has had two major effects. First, many of the radionuclide release limits in the containment requirements have

increased (without changing the population risk objective) due to changes in the environmental pathway, dosimetry, and biological effect analyses; in this respect, the final containment requirements are somewhat less stringent than those in the proposed rule. Second, the lower risk estimates for geologic disposal resulting from these and other changes in the technical analyses (see Figure 1 in the response to SAB Finding 2) make it appear much less likely that the final containment requirements are "too restrictive" or that compliance may be "difficult to verify".

Finding 13: "In reviewing this conclusion (that the risks to future generations will be no greater than the risks from equivalent amounts of naturally occurring uranium ore), we found, and EPA acknowledged, that the comparison is uncertain because of the extreme variability of uranium ore bodies. The Subcommittee thinks that the conclusion is valid in a very general way, if suitably qualified, but feels that it is unwise and not scientifically defensible to use the unmined ore as the only reference for comparison." (ES p.6)

"We recommend that EPA downplay the comparison of repository releases with unmined uranium ore bodies by expanding the comparison to include the radioactivity of natural waters and ambient radiation in the natural environment." (MFR p.15)

"We recommend that EPA emphasize more strongly that somatic and genetic effects resulting from repository releases that meet EPA's proposed standard are at least in part substitutional effects, rather than additive to those expected from the unmined ore." (MFR p. 15)

Response: The Agency believes that it is a useful perspective to note that the long-term risks expected from disposal of these wastes appear to be no more than (and probably less than) the risks that future generations would have been exposed to if the uranium ore used to create the wastes had not been mined. The Agency agrees that there are important qualifications to this comparison. First, it can be shown only in a general sense because there will always be large variations in the risks predicted for both ore bodies and disposal systems. Second, it must be emphasized that the comparison does not necessarily mean there is "zero-risk" to future generations from the activities used to create the wastes, for these activities present other long-term risks besides those associated with high-level radioactive waste disposal. The Agency also agrees that it is useful to add other perspectives on radiation exposures, and the preamble to the final rule discusses the radioactivity of natural waters and ambient radiation in the natural environment.

Finding 14: "The Subcommittee considers there are significant shortcomings in the economic analyses supporting the proposed standards. Since the mangement, storage, and disposal of high-level waste is a multi-billion dollar venture, we believe that the shortcomings are important and should be remedied." (ES p.7)

Public Comment: Both commenters (M-5, M-36) believed that a better economic analysis is needed, however, DOE is in a much better position than EPA to do detailed economic analyses, such as cost/benefit, differential costs and benefits for widely different levels of protection, costs for alternate means of disposal, and cost savings in the waste disposal program.

Response: Updated information and other recommendations of the SAB Subcommittee have been considered in preparing the Final Regulatory Impact Assessment (RIA) for 40 CFR Part 191. However, as the Subcommittee notes in other findings, enough information is not yet available to support the more sophisticated economic analyses that could overcome the limitations of the present effort.

Finding 15: "It is noteworthy that, even though the savings associated with individual choices may seem relatively insignificant, the absolute costs are so large that even small percentage savings are worthwhile. The high absolute costs appear to be relatively independent of the proposed standard, and simply reflect the decision to use deep mined geologic disposal sites with multiple barriers. Thus, appreciable savings are not likely to be realized in terms of basic cost by relaxation of the standards. However, the cost of demonstrating compliance may be very high, and cost reductions that may be achieved by sophisticated compliance demonstrations could be substantial." (ES p.7)

Public Comment: Disagrees that "relaxation of the standards" will result in "appreciable savings". (M-3)

Response: The Agency agrees that "appreciable savings are not likely to be realized in terms of basic cost by relaxation of the standards." With regard to costs of determining compliance (which the Agency thinks will be a relatively small fraction of the overall costs in any case), Section 191.13(b) and the "Guidance for Implementation of Subpart B" section in the final rule have been added to alleviate unwarranted complexities in implementation.

Finding 16: "We recommend that EPA adopt a standard which provides adequate protection with regard to societal effects; which can be met technically for at least some known technological approaches; on which it will be practical for NRC to make a favorable finding with reasonable assurance; and which does not needlessly induce or lend itself to long controversy and delay in arriving at a decision in the regulatory framework and in the courts." (MFR p. 10)

Response: In general, these have always been the Agency's objectives in developing this rule. The only caveat concerns the "finding with reasonable assurance". EPA is not sure that the same concept of "reasonable assurance" that the NRC and its predecessor have used for many years is appropriate when applied to the large analytical uncertainties inherent in the projections that will be needed to determine compliance with the

disposal standards. Therefore, 40 CFR Part 191 calls for a "reasonable expectation" of compliance with the numerical disposal standards, allowing for different judgments than might be associated with the often rigorous test of "reasonable assurance".

Finding 17: "We believe that repository designers will find it quite difficult and perhaps excessively expensive to demonstrate with reasonable or high assurance that the levels of protection sought by EPA in the draft standard have been met." (MFR p.10)

Response: The Agency is not sure that the Subcommittee's assertion with respect to the proposed rule is reasonable. However, it is not EPA's intention that the numerical disposal standards must be met with a "high" degree of confidence in a mathematical sense (for example, demonstrating compliance with a 95% confidence level). Instead, the "Guidance for Implementation of Subpart B" appendix published with the final rule describes less rigorous procedures that EPA believes are appropriate for implementation of the disposal standards. Accordingly, the Agency does not expect that demonstrating compliance with the disposal standards will be unreasonably difficult or expensive.

Finding 18: "We recommend that EPA, in their calculations, drop the ambiguous terminology 'health effects' when specific reference to somatic (cancer) and/or genetic effects can be made." (MFR p.16)

"The term 'health effects' is often used when actually referring to cancer mortality. While cancer-related effects may predominate over genetic related effects, it is important to recognize that both may occur, and more specific language is therefore needed." (MFR p.16)

Response: Appropriate changes to specify "fatal cancers" or "genetic effects" have been made throughout all of the documents describing the final rule and its supporting analyses.

Finding 19: "We accept EPA's use of the linear non-threshold model for estimating health risks." (MFR p.16)

"Although other models for estimating health risk are available and despite uncertainties about the validity of the linear non-threshold model in particular, this model is generally accepted for radiation protection purposes by professionals as the conservative model of choice." (MFR p.16)

Response: None required.

Finding 20: "We recommend that EPA consider the genetic effects to all future generations, rather than limiting them to the first generation." (MFR p.16)

"Somatic effects have been appropriately calculated on a generation-by-generation basis. Genetic effects differ, however, in that they cumulate as a result of transferral from one generation to another. Even though genetic effects are commonly less numerous and less serious than somatic, it is possible for the accumulated harm from genetic effects in any generation to be as great as that from somatic effects over the passage of 10,000 years. To make an accurate comparison with somatic effects, it is necessary to compute genetic effects over all generations within a given time period." (MFR p.16)

Response: The technical analyses supporting the final rule calculate the potential equilibrium genetic effects to all generations produced by radiation exposure from potential releases from a disposal system, rather than just the first generation affected. This has increased the respective genetic effect estimates from those used for the proposed rule; however, the potential genetic effects are still relatively small compared to the corresponding somatic health effects (fatal cancers).

Finding 21: "We recommend that EPA consider using the concept of effective dose equivalent in setting a dose limit in Subpart A of the proposed standard." (MFR p.16)

"In Subpart A of 40CFR191, EPA specifies dose limits of 25 mrem/yr to whole body, 75 mrem/yr to the thyroid, or 25 mrem/yr to any other organ. These limits are the same as those in 40CFR190, and they are based essentially on the critical organ approach to radiation protection. In Subpart B, however, the radionuclide release limits are derived using a sum of dose equivalents to different body organs weighted by the stochastic risk factors for each organ. This is the same approach as the effective dose equivalent described in reports of the International Commission on Radiation Protection (ICRP 26 and 30). Thus, the two approaches to calculating doses in Subparts A and B are clearly not consistent." (MFR pp.16-17)

Response: The Agency was aware prior to proposing the rule that the approaches reflected in Subparts A and B of the proposed rule were not consistent and that Subpart A was based on the "critical organ" approach. (Similar standards for airborne radionuclide emissions recently promulgated under the Clean Air Act (CAA), which were developed using effective dose equivalents, are 25 millirems/year to the whole body and 75 millirems/year to any organ.) In the final rule, Subpart A has been divided into two sections: one for NRC-licensed waste management and storage facilities and one for waste management and storage operations at DOE disposal facilities that are not licensed by NRC. The section of Subpart A that applies to NRC-licensed facilities will be jointly implemented with the existing uranium fuel cycle standards in 40 CFR Part 190, which are based on the older "critical organ" concept. Therefore, the two sets of standards must be equivalent for practical implementation. Rather than amend Part 190, the Agency has chosen to have this part of Subpart A adopt the older concept by using the same dose limits as Part 190. The portion of the final Subpart A that applies only to non-

NRC-licensed facilities adopts the effective dose equivalent approach by using the same limits utilized in the CAA standards. Thus, the inconsistency in approach remains because of the need to be compatible with the older standards.

Finding 22: "We recommend that the assurance requirements, as amended by this report, be submitted as a Federal Radiation Protection Guidance document in support of the EPA rule package." (MFR p.17)

Public Comment: Four commenters (M-5, M-17, M-36, M-37) agreed. Four other commenters (M-2, M-10, M-12, M-15) disagreed but for various reasons. Two (M-2, M-12) believe that retention of the requirement is important but would accept their inclusion in NRC's regulations and DOE's guidelines if they had to be dropped from 40 CFR Part 191. One (M-10) attacked the proposal as being "beyond the Subcommittee's expertise and mandate"; another (M-15) used the same argument but continued on to note that there was no legal analysis or rationale for the change which would assure the effective implementation of 40 CFR Part 191.

Response: The Agency considered the possibility of issuing the assurance requirements as Federal Radiation Protection Guidance, rather than as part of the standards. However, this would add significantly to the complexity of this rulemaking. Furthermore, many of the commenters supporting the assurance requirements believe that these principles are too important to be issued "merely" as Federal guidance and should be incorporated into formal regulation. Accordingly, the Agency has retained the assurance requirements, as modified in accordance with other comments, in the final rule for those disposal facilities that will not be licensed by NRC. The final assurance requirements in 40 CFR Part 191 do not apply to NRC-licensed facilities because NRC is developing equivalent provisions to incorporate into its 10 CFR Part 60.

Finding 23: "We recommend that EPA delete the assurance requirement for prompt disposal of high-level and transuranic wastes." (MFR p.17)

"There is a requirement in the Nuclear Waste Policy Act for DOE to assess the advantages of long-term storage. Temporary storage for 20-30 years is accepted practice to allow spent fuel to 'cool down'. It may also be advantageous for ease of computation, lesser disturbance of the geologic environment, etc., to extend the cooling period. The prompt disposal requirement in the proposed standards appears inconsistent with these considerations, and should be reexamined accordingly." (MFR p.18)

Response: The Agency believes that the passage of the NWPA clarifies the nation's commitment to develop disposal facilities for high-level radioactive wastes and spent fuel, while allowing for temporary storage facilities compatible with this commitment. Therefore, the assurance requirement calling for prompt disposal no longer seems necessary and has been deleted from the final rule.

Finding 24: "We recommend that use of the concept of as 'small (low) as reasonably achievable' (ALARA) be limited to the consideration of the geologic characteristics of sites nominated in accordance with the Nuclear Waste Policy Act." (MFR p.17)

Public Comment: Three commenters (M-2, M-3, M-11) support the ALARA concept, but disagree with the recommendation because they believe it should apply to the entire site selection process. Another commenter (M-35) said the ALARA philosophy should not be stated as a standard. This commenter also stated that the Subpart A dose limits "are not consistent with other EPA (or Federal) standards, and are truly de minimis."

Response: As discussed in the preamble to the final rule, the Agency believes that the requirements for engineered barriers in 10 CFR Part 60 adequately represent considerations of "ALARA" for the engineered portions of high-level radioactive waste and spent fuel disposal systems. Furthermore, as described in response to SAB Finding 7, the provision in the DOE site selection guidelines (10 CFR Part 960) calling for comparative site evaluations should encourage choosing sites that provide the best isolation among the alternatives considered. While continuing to support the concept, in this case the Agency believes that the proposed assurance requirement calling for releases to be as small as reasonably achievable is no longer necessary and has been deleted from the final rule.

Finding 25: "We recommend that the assurance requirement for use of multiple barriers be revised to give more emphasis to the system as a whole, rather than to the performance of each barrier acting alone. Barriers should be designed so that they complement each other and help to compensate for unexpected failures." (MFR p.17)

"The present wording of assurance requirement (c) that 'each barrier shall separately be designed to provide substantial isolation' has the implication that any one barrier acting alone should enable the repository to comply with the proposed standard. We think that it is more important that the system of barriers as a whole be designed to compensate for the unexpected weakness or failure of one or two members." (MFR p.18)

Response: The Agency agrees, and corresponding changes have been made in the assurance requirement included in the final rule.

Finding 26: "We recommend that EPA limit the time period during which repository designers may take credit in their analyses for reliance upon active institutional controls to a period of no more than 100 years, and that suitable surveillance be required during that period. Surveillance techniques should not compromise the integrity of the repository. The definition of active institutional controls should be changed so that guarding, maintaining, and taking appropriate remedial actions are all required." (MFR p.17)

Public Comment: Both of the commenters (M-2, M-3) on this issue agreed with the recommendation.

Response: The Agency agrees with these recommendations. The assurance requirements in the final rule have been revised to limit assumptions about reliance on active institutional controls to no more than 100 years. At the same time, continuation of such active controls (even though they are not "relied upon") is required for as long a period as is reasonable. Finally, a new assurance requirement calling for long-term monitoring of disposal systems after closure has been added to the final rule.

Finding 27: "We recommend that EPA not preclude consideration of a potential repository site because natural resources are at or near the site, but rather should note that the presence of such resources is a highly unfavorable factor which should be included in the site evaluation." (MFR p.17)

Public Comment: Three commenters (M-2, M-3, M-11) believed that the SAB is going against the intent of the NWPA and to adopt the recommendation would be a significant and possibly fatal weakening of the standards.

Finding 28: "No site type should be precluded on the basis of site characteristics alone. Consideration of all factors, including engineered barriers, transportation, availability of utilities and labor, etc., may lead to different choices amongst acceptable sites and isolation technologies than those dictated by site characteristics alone." (MFR p.22)

Public Comment: The only comment here was that EPA should clarify its intentions on this recommendation so that it is consistent with the NWPA. (M-3)

Response (Findings 27 and 28): Because of the inherent uncertainties in the site selection and evaluation process, and because of the desirability of evaluating a variety of alternatives to increase the chances of achieving exceptional environmental protection, the Agency now agrees that automatically precluding a potential site because of one disadvantage is not desirable. At the same time, the Agency still believes that proximity to important or unique resources is a serious problem because of the potential for unplanned human intrusion, since institutional controls cannot be counted on over these periods of time to prevent such intrusion. Therefore, the Agency has modified the assurance requirement in the final rule to indicate that proximity to resources should be considered a serious disadvantage, but not an outright prohibition, for site selection.

Finding 29: "We recommend that the applicability of Subpart B of the proposed standards be explicitly restricted by EPA to disposal in mined geologic repositories." (MFR p.22)

"The present wording implies that the standard is intended to cover all methods of disposal except disposal directly into ocean sediments. To avoid any implication that other methods of disposal were evaluated, and therefore to avoid foreclosing other possibilities, the standard should be limited to disposal in mined geologic media." (MFR p.23)

Public Comment: The only commenter on this finding, the NRC (M-37), agreed with it.

Finding 30: "We recommend that assurance requirement (g) on retrievability of waste be deleted." (MFR p.17)

Response (Findings 29 and 30): The Agency does not agree with these recommendations. Although the Agency only evaluated mined geologic repositories in detail in developing 40 CFR Part 191, it seems appropriate that alternative disposal systems should provide protection which is at least as good as mined repositories if such alternatives are to be utilized. Nor does the Agency believe that it would be necessary for alternatives to provide more protection that mined repositories. Thus, the final rule is designed to be applicable to any potential disposal method except disposal in the ocean or ocean sediments (which is prohibited by United States law). Because of this broad applicability, the Agency also believes it is important to rule out disposal methods which might not be reversible even very shortly after they were implemented. The preamble to the final rule emphasizes that all mined geologic repositories inherently satisfy this requirement, but techniques such as deep well injection of liquid wastes probably would not. Therefore, the Agency has retained the assurance requirement in the final rule that calls for the wastes to be recoverable for a reasonable period of time after disposal.

Finding 31: "We recommend that EPA extend the definition of 'accessible environment' to include major sources of potable groundwater that are beyond the controlled area, as defined by NRC in 10CFR60 (Technical Criteria for Disposal of High-Level Radioactive Waste), and are more than two (2) kilometers in a horizontal direction from the original location of the radioactive wastes in a disposal system." (MFR p.19)

"This consideration is to note the specific importance of potable groundwater as a much needed resource, particularly in the western areas of the country. Protecting this resource, as reflected by this position, indicates that we feel the importance of potable groundwater supplies will not diminish in the future and may become even more important." (MFR p.19)

Public Comment: Three commenters (M-2, M-3, M-36) agreed with the finding, except that one (M-2) preferred the use of EPA's "controlled area" definition.

Response: The Agency agrees that ground water resources deserve very good protection. Accordingly, several steps have been taken in the final

rule to enhance the protection of ground water. First, the definition of the "accessible environment" has been modified to include all ground water outside of a "controlled area". This "controlled area" is not to exceed a horizontal distance of 5 kilometers from the disposal system or to include a total area of more than 100 square kilometers (which would correspond to a distance of about 3 kilometers from the disposal system if the controlled area were symmetric with respect to the repository). Thus, the areal extent of potential ground water sources not included within the accessible environment is only slightly larger than that recommended by the SAB Subcommittee. The Agency did not select a distance of 2 kilometers because it could be incompatible with the NRC's existing requirement for a 1000-year pre-emplacement ground water travel time to the accessible environment (which was developed on the proposed 10 kilometer distance). Second, individual protection requirements (Section 191.15) have been added to the final rule which will limit potential exposures to people who use ground water outside of the controlled area for 1,000 years after disposal. And third, ground water protection requirements (Section 191.16) have been added to protect people who drink water from certain important aquifers either inside or outside the controlled area for 1,000 years after disposal.

Finding 32: "We recommend that EPA define clearly all models used in their analyses, if not already so documented, and ensure that state-of-the-art information is used." (MFR p.19)

Response: In those areas where extensive documentation was not already provided, the Agency has provided it in the documents supporting the final rule. Furthermore, all of the analyses have been revised to incorporate the latest information available.

Finding 33: "We recommend that EPA, in their environmental pathways modeling, re-evaluate the assumed fraction of activity transported to the land surface via irrigation and make provision in the models for recycling activity leached from soils and returned to the rivers." (MFR p.19)

Response: The fraction has been reduced from 0.5 to 0.1, which is the average fraction of total surface water flow used for irrigation in the United States.

Finding 34: "We recommend that the environmental pathways models be modified to incorporate the time dependence of resuspended activity in soils and of external ground-surface exposure." (MFR p.19)

Response: The environmental pathway models have been appropriately modified to incorporate this time dependence.

Finding 35: "We recommend that EPA improve the evaluation of uncertainties inherent in all aspects of the analyses, including movement to the

the accessible environment, the modeling of exposures through various environmental pathways, and conversion of doses to somatic and genetic effects." (MFR p.19)

Response: The reports of the risk assessments supporting the final rule discuss the effects of uncertainties in all areas of the analyses more thoroughly than in the reports supporting the proposed rule.

Finding 36: "We recommend that dilution not be an acceptable practice to avoid the regulations for disposal of material as high-level waste, but that it be considered as a reasonable means of converting minute quantities of high-level or TRU waste into material that can be disposed of under 10CFR61 (Licensing Requirements for Land Disposal of Radioactive Wastes)." (MFR pp.20-21)

Response: The Agency agrees with the intention of this recommendation, but does not believe that it requires any modification to 40 CFR Part 191. The Agency believes that the NRC has adequate plans and procedures that will ensure appropriate disposal of such materials.

Finding 37: "We recommend that EPA perform an economic analysis (benefit/cost analyses; differential costs and benefits for widely different levels of protection; and costs for alternate means of disposal) in addition to the cost analysis already presented. In making this analysis EPA should use more current cost models and data now available." (MFR p.21)

"Given the data available at that time (early 1982), the cost analysis (see draft Regulatory Impact Analysis, EPA 520/1-82-024) is reasonably comprehensive and adequate, and uses data valid in early 1982. New data, however, are now available, e.g., Waddell et al., Engel and White, Clark and Cole, and the Defense Waste Management Plan." (MFR p.21)

Response: The Agency has updated the cost data used in the Final Regulatory Impact Analysis using the references noted by the SAB Subcommittee, and qualitative benefit/cost assessments have been made for those few situations where significant cost impacts were identified. The Agency does not agree that a wider range of levels of protection needs to be considered (the current range is from 100 to 10,000 health effects over 10,000 years). This range is adequate to consider effects on mined repositories, and it does not appear necessary to consider the appropriateness of mined repositories themselves, since Congress has already focused the national program on this method through the NWPA.

Finding 38: "We recommend that EPA examine carefully the possibilities for cost savings in the waste disposal program. Though the uncertainties in the cost estimates are great, the absolute amounts involved are so large that even small percentage savings could represent substantial amounts of money." (MFR p.21)

Response: The Agency agrees that such an examination would be useful. However, except to consider possible effects of these standards, the Agency is not responsible for determining the most cost effective methods of disposal. Therefore, the Agency's only response to this recommendation consists of the cost analyses performed in the Final RIA.

Finding 39: "We recommend that EPA consider discounted, as well as non-discounted, costs for the operational period. This will help to disclose the significance of sequencing and delays on site selection and engineering designs of repositories." (MFR p.21)

"Discounted cost procedures recognize that expenditures incurred early in repository development are of greater significance than the same amounts expended later. The relative importance of the various cost components in waste isolation could be changed drastically by the use of discounted dollars." (MFR pp.21-22)

Response: Both undiscounted costs and costs discounted at rates of 2 and 10 percent for each of the elements of waste disposal are displayed in the Final RIA.

Finding 40: "For a generic, deterministic study the aggregated, simple model used by EPA is adequate for a cost analysis. However, the cost for actual repositories at specific sites could diverge substantially from these generic costs." (MFR p.21)

Response: The Agency agrees with this comment; however, no assessment of the divergence in cost is possible at this time.

Finding 41: "We recommend that EPA analyze the practicality of implementing the suggested dose limits (under Subpart A) at facilities that include operations of both the uranium fuel cycle and the management and storage of high-level wastes." (MFR p.22)

Response: Subpart A of the final rule has been revised so that any exposures from: 1) NRC-licensed and 2) non-NRC-licensed waste management and storage facilities no longer have to be considered in combination. Exposures from NRC-licensed waste management and storage facilities and uranium fuel cycle facilities do have to be considered in combination. Currently, however, there do not appear to be foreseeable circumstances where such combined consideration should be impractical to implement.

Finding 42: "We recommend that EPA, in their generic analyses, utilize different sets of geochemical parameters for high-ionic-strength environments (such as salt) and for the much lower-ionic-strength waters expected in many other lithologies." (MFR p.23)

Response: Media-specific geochemical parameters have been adapted from the National Academy of Sciences' (NAS) Waste Isolation Systems Panel (WISP) report for use in the performance assessments supporting the final rule.

Finding 43: "We recommend that EPA reassess the values it chose for solubility and retardation factors for Am, Sn, Sr, Cs, Tc, and Np." (MFR p.23)

Response: Different, generally less conservative values (i.e., less likely to overestimate the risks from repositories) have been selected for most of these radionuclides. In particular, much lower values for the solubility of americium have resulted in substantially lower long-term projections of risks due to inadvertent human intrusion into repositories.

Finding 44: "We recommend that EPA's definition of high-level radioactive wastes be consistent with that set forth in the Nuclear Waste Policy Act (NWPA) and coordinated with the definition used by the Nuclear Regulatory Commission (NRC)." (MFR p.24)

Public Comment: The only comment on this recommendation was supportive and the commenter, the NRC (M-37), noted that drafts of 40 CFR Part 191 later than the proposed rule have "contained an appropriate definition".

Response: The final rule defines "high-level radioactive waste" by directly referencing the definition in the NWPA. The preamble to the final rule states that the Agency will follow the anticipated rulemaking by the NRC to further specify the details of the NWPA definition, and that EPA will consider any appropriate modifications to the 40 CFR Part 191 definition upon NRC's completion of its rulemaking.

Finding 45: "We recommend that EPA check the definition of TRU waste to ensure consistency, both within EPA and among EPA, DOE and NRC." (MFR p.24)

Response: The definition has been changed to allow flexibility for conformance with NRC and DOE practices.

Finding 46: "We recommend that a suitable equivalency to the MTHM concept (such as one based on number of fissions) be established for defense wastes, and for some kinds of commerical wastes." (MFR p.24)

Response: The final rule contains procedures for determining roughly equivalent amounts of spent fuel (or the high-level radioactive waste produced from the spent fuel) that have received substantially different exposures than is typical for commercial electrical power reactors. These procedures are needed to determine appropriate release limits for disposal systems containing such spent fuel or high-level radioactive waste.

Chapter 3: EPA'S RESPONSES TO OTHER PUBLIC COMMENTS REGARDING THE SAB SUBCOMMITTEE REPORT

Public Comment: "The SAB should not have mixed policy with science." (M-3, M-10, M-15)

Response: The Agency agrees that it is desirable to keep policy of "risk management" issues as separate as possible from questions of science. However, this was particularly difficult in this case because the Agency arranged this SAB review to run concurrently with the public comment period on the proposed rule. As the Chairman of the Subcommittee noted in his letter transmitting the report to the Administrator: "... given the timing of its review in the rulemaking process, the Subcommittee found it virtually impossible to separate scientific and technical evaluations from matters of policy, since they are so interdependent." To reduce this problem in the future, the Agency will attempt to conduct its SAB reviews of supporting technical information before the corresponding rule is completed and available for public comment.

Public Comment: "The SAB report reflects overconfidence and overoptimism regarding the DOE's ability to overcome the technical and institutional obstacles to safe disposal of high-level and transuranic nuclear wastes." (M-3)

Response: The Agency believes that the Subcommittee was well aware of the many difficulties that DOE will likely encounter over the many years before a disposal system is available. The Agency thinks that it is important that such "obstacles" be satisfactorily resolved in a reasonable time frame in order to proceed with disposal of these dangerous materials.

Public Comment: "We strongly disagree with recommendation 6 of the Assurance Requirements Subgroup that the engineered barriers be relaxed for TRU waste." (M-3)

Response: The assurance requirement calling for both engineered barriers and natural barriers in the final rule does not distinguish

between high-level and transuranic radioactive wastes. Although the wording of the assurance requirement has changed from the proposed rule, the Agency does not believe the requirement has been significantly changed.

Public Comment: Based on what they believe are needed changes in the societal objective and "to perfect the proposed approach to uncertainty and define margins of safety," that "...renoticing the standard in the Federal Register for an additional 180-day period for public and federal comment" is "fully justified." (M-39)

Response: Because of the recent court order mandating promulgation of this rule by August 15, 1985, because of the importance of 40 CFR Part 191 to the orderly progress of the national program to dispose of these materials, and because substantial opportunities for public review and comment have already been provided, the Agency believes it is appropriate to proceed to complete this rulemaking at this time.

APPENDIX A

LIST OF PUBLIC COMMENTERS

APPENDIX A

LIST OF PUBLIC COMMENTERS

M-2 Harmon, Weiss & Jordan, Washington, D.C. on behalf of the Yakima Indian Nation in the State of Washington.

M-3 Southwest Research and Information Center, Albuquerque, New Mexico.

M-4 Nuclear Waste Project Office, Office of the Governor of Nevada.

M-5 Edison Electric Institute, Washington, D.C.

M-6 Ronald A. Martin, Shreveport, Louisiana.

M-7 Margaret Marshall, Hereford, Texas.

M-8 Viviana Patino, Hereford, Texas.

M-9 Appalachia - Science in the Public Interest, Livingston, Kentucky.

M-10 Natural Resources Defense Council, Inc., Washington, D.C.

M-11 Hanford Oversight Committee, Seattle, Washington.

M-12 Office of the Governor of the State of Texas.

M-13 Jim Steiert, Hereford, Texas.

M-14 Lisa Blakely, Hereford, Texas.

M-15 Environmental Policy Institute, Washington, D.C.

M-16 Brandie Lee Redinger, Arlington, Virginia.

M-17 Middle South Services, New Orleans, Louisiana.

M-18 Georgia Power Company, Atlanta, Georgia.

M-19 Karl Z. Morgan, Atlanta, Georgia.

M-20 Vicki P. Harrell, Jackson, Mississippi

M-21 Hans Frauenfelder, Urbana, Illinois, for the Environmental Policy Institute.

M-22 Mrs. Durley E. Hanson, Richton, Mississippi.

M-23 Dorothy Gatlin Cole, Richton, Mississippi.

M-24 Perry County Citizens Against Nuclear Disposal, Inc., Richton, Mississippi.

M-25 Carolina Power & Light Company, Raleigh, North Carolina.

M-26 Susan Mayfield, Jackson, Mississippi.

M-27 Cynthia Gavette, Jackson, Mississippi.

M-28 Virginia Munford, Jackson, Mississippi.

M-29 James Gavette, Jackson, Mississippi.

M-30 Mrs. David R. Mann, Jackson, Mississippi.

M-31 Governor of the State of Mississippi.

M-32 David & Lucille Reeves, Macon, Mississippi.

M-33 Catherine Thompson, Columbia, Mississippi.

M-34 Citizens Against Nuclear Disposal, Biloxi, Mississippi.

M-35 Kerr-McGee Corporation, Oklahoma City, Oklahoma.

M-36 Atomic Industrial Forum, Bethesda, Maryland.

M-37 Nuclear Regulatory Commission, Washington, D.C.

M-38 David and Mary Jo Childress, Laurel, Mississippi.

M-39 American Nuclear Society, LaGrange Park, Illinois.

M-40 William C. Thompson, Hattiesburg, Mississippi.

APPENDIX B

ACRONYMS

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ACRONYMS

BID	Background Information Document
CFR	Code of Federal Regulations
CIPRPC	United States Committee on Interagency Radiation Research and Policy Coordination
DOE	United States Department of Energy
EPA	United States Environmental Protection Agency
ES	Executive Summary section of the Science Advisory Board report
ICRP	International Commission on Radiological Protection
MFR	Major Findings and Recommendations section of the Science Advisory Board report
MTHM	Metric tons of heavy metal
NRC	United States Nuclear Regulatory Commission
NWPA	Nuclear Waste Policy Act of 1982 (Public Law 97-425, 96 Stat. 2201)
ORP	Office of Radiation Programs, U.S. Environmental Protection Agency
RIA	Regulatory Impact Analysis
SAB	Science Advisory Board, U.S. Environmental Protection Agency
TRU	Transuranic
USGS	United States Geological Survey